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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/783,265	02/19/2004	Young Nam Kim	006343.P002	7317

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Stephen M. De Klerk  
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP  
Seventh Floor  
12400 Wilshire Boulevard  
Los Angeles, CA 90025

EXAMINER
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ONEILL, KARIE AMBER

ART UNIT	PAPER NUMBER
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1795

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05/23/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/783,265	<b>Applicant(s)</b> KIM, YOUNG NAM	
	<b>Examiner</b> Karie O'Neill	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 March 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 8,9,12-16,20 and 23-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8,9,12-16,20 and 23-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>3-25-08</u> .   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 10, 2008, has been entered.

The Applicant's amendment filed on March 10, 1008, was received. Claims 8 and 12 were amended. Claims 1-7, 10-11, 17-19 and 21-22 have been cancelled. Claims 23-30 have been added as new. Therefore, Claims 8-9, 12-16, 20 and 23-30 are pending in this office action.

### ***Priority***

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d) or (f), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

3. Information disclosure statement (IDS), submitted March 25, 2008, has been received and considered by the examiner.

### ***Claim Rejections - 35 USC § 103***

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4. The rejection of Claims 8-9, 12, 14-16 and 20 under 35 U.S.C. 103(a) as being unpatentable over Dasgupta et al. (US 2003/0152835 A1) in view of Gurin (US 2003/0151030 A1 ), is overcome because the arguments with regard to the amended claims are persuasive.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 8-9, 12, 14-16, 20, 23-25 and 27-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. (US 7,029,796 B2) in view of Dasgupta et al. (US 2003/0152835 A1).

With regard to Claims 8, 20, 23 and 30, Choi et al. discloses a process for preparing a carbon nanotube electrode for a lithium secondary battery comprising the steps of:

(1) preparing an electrode material by depositing a binder selected from the group consisting of sulfur having an average particle size of or less on the carbon nanotubes, wherein the binder has the effect of minimizing the internal resistance of the electrode. Choi et al. discloses preparing a positive active electrode material by forming an agglomerated complex manufactured by mixing sulfur powder having an average particle size of less than 3  $\mu\text{m}$  with a conductive agent which includes carbon nanotubes (column 5 lines 23-63). Choi et al. does not specifically disclose wherein the sulfur

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binder has the effect of minimizing the internal resistance of the electrode, however such properties are inherent, given that both Choi et al. and the instant application utilize the same materials. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. See MPEP 2112.

(2) Choi et al. discloses preparing a pressed electrode material by providing the agglomerated complex onto a current collector and rolling it to provide an electrode plate (column 6 lines 31-40). The rolling process will occur with a pressure of at least 1 atm, since 1 atm is considered standard pressure.

Choi et al. does not disclose the step of: (3) subsequently pressing under a pressure from 1 to 500 atm, or heat- treating at a temperature in the range of the melting point of the sulfur or metal nanoparticles +200°C in inert gas atmosphere, or simultaneously pressing under the said pressure and heat-treating at the said temperature in inert gas atmosphere the previously pressed electrode material that is placed on a current collector so that the carbon nanotubes are bonded to each other and simultaneously bonded to the current collector.

Dasgupta et al., however, discloses preparing an electrode material by mixing nanometer sized carbon tubes or nanofibers with spherical graphite, which contain about 1.5% to 15% carbon nanotubes, with a binder (paragraph 0023); preparing a pressed electrode material by first pressing the graphite/carbon nanotube/binder mixture into a pressed compact with copper foil on one side (paragraph 0023); and subsequently heat-treating, the heat-treating temperature range being from 40°C to

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85°C (paragraph 0016). Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to subsequently heat treat the pressed electrode material of Choi et al., because Dasgupta et al. teaches that by heat treating, significant cycle life increases are obtainable by not exceeding too high of a temperature damage to the constituents will be avoided (paragraphs 0027-0028). One skilled in the art would recognize that pressing is obvious in the range of 1-500 atm in order to form an electrode since 1 at, is standard pressure.

With regard to Claims 9 and 24, Choi et al. discloses wherein in step (2), the electrode material is uniformly dispersed on a current collector and then pressed or rolled (column 6 lines 31-40 and 47-48).

With regard to Claims 12 and 25, Choi et al. discloses wherein in step (1), the depositing of the binder on the carbon nanotubes is performed by a method chosen from the group consisting of physical mixing by ball-milling, prepared with or without adding a solvent (column 5 lines 60-67 and column 6 lines 1-3).

With regard to Claims 14 and 27, Choi et al. discloses wherein the primary pressing in step (2) provides the electrode material in the shape of a plate (column 6 line 40) which could be a disk.

With regard to Claims 15 and 28, Dasgupta et al. discloses wherein in step (3), the pressing and the heat-treatment are carried out consecutively (paragraphs 0026-0028).

With regard to Claim 16 and 29, Dasgupta et al. discloses wherein in step (3) the heat treatment is carried out by through thermal heating in a temperature range from 45°C to 80°C (paragraph 0016).

7. Claims 13 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. (US 7,029,796 B2) and Dasgupta et al. (US 2003/0152835 A1), as applied to Claims 8-9, 12, 14-16, 20, 23-25 and 27-30 above, and in further view of Choi et al. (US 2004/0018416 A1).

Choi et al. and Dasgupta et al. disclose the process in paragraph 6 above, but do not disclose wherein the method of uniformly dispersing sulfur or metal nanoparticles on the surfaces of carbon nanotubes is carried out by a method selected from the group consisting of catalytic impregnation followed by an optional oxidation or reduction, precipitation, chemical vapor deposition (CVD), electrodeposition, plasma spraying, and sputtering.

Choi et al. (US 2004/0018416 A1) discloses wherein in step (1), the mixing of carbon nanotubes with metal nanoparticles is performed by a method chosen from the group consisting of uniformly dispersing the metal nanoparticles on the surfaces of the carbon nanotubes (paragraph 0031) and wherein the method of uniformly dispersing the metal nanoparticles on the surfaces of the carbon nanotubes is carried out by a method selected from the group consisting of electrophoresis, thermal spraying, sputtering, chemical vapor deposition and any other techniques common to one of ordinary skill in the art (paragraph 0033). Therefore, at the time of the invention, it would have been

obvious to one of ordinary skill in the art to uniformly disperse the metal nanoparticles on to the carbon nanotubes of Choi et al. (US 7,029,796) and Dasgupta et al., because Choi et al. (US 2004/0018416 A1) teach evenly distributing metal nanoparticles on to the carbon nanotubes so that they are fixed stably thereto so as not to be affected by an external force (paragraph 0029).

### ***Response to Arguments***

8. Applicant's arguments with respect to Claims 8-9, 12, 14-16 and 20 under 35 U.S.C. 103(a) as being unpatentable over Dasgupta et al. (US 2003/0152835 A1) in view of Gurin (US 2003/0151030 A1 ), have been considered but are moot in view of the new ground(s) of rejection.

*Applicant's principal arguments are:*

*(a) Applicant asserts that both claims 8 and 23 contain a Markush group claim which is by definition closed and excludes any element, step, or ingredient not specified in the claim. Therefore, the Markush group explicitly excludes a binder comprised of materials such as organic polymers in conjunction with sulfur or metal nanoparticles. Because applicant has used the words "group consisting of", the binder materials are closed and therefore cannot contain other materials in contrast to the Examiner's assertion.*

*(b) Applicant argues that the amendment is made to clarify that the technical ideas of the present invention lie in that the sulfur or metal nanoparticles are used as a binder to solve a technical problem that the internal resistance of the electrode is*



*increased due to the organic binders when organic polymers are used as a binder.*

*Such technical feature is supported by a fact that the electrodes prepared according to the TEST 1 to TEST 7 described in the present specification at page 32, lines 1-6 have internal resistance lower than the values of internal resistance reported previously.*

*(c) Applicant asserts that Dasgupta et al. carries out the heat treatment of D1 in a vacuum state, and thus it is different from the heat treatment in inert gas atmosphere of minimizing the internal resistance of the electrode by binding the CNTs as well as between the electrode material and the current collector of step (3) of the present invention. In addition, step (3) of the present invention recites performing a heat treatment at a high temperature and simultaneously pressing under a high pressure in order to produce such an effect as above, whereas D1 does not disclose such technology.*

*(d) Choi et al. (US 2004/0018416) merely discloses metal particles as a catalyst used when generating carbon nanotubes, but does not disclose or suggest the use of metal particle as a binder for binding carbon nanotubes. Thus, even a person having ordinary skill in the art cannot easily derive using sulfur or metal nanoparticles as a binder instead of an organic binder for preparing an electrode material from Choi et al. Therefore, it is clear that the present invention cannot be easily achieved by a person having ordinary skill in the art from the combination prior art.*

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In response to Applicant's arguments, please consider the following comments:

(a) Examiner acknowledges the assertion that by using the words "group consisting of", the binder materials are closed and therefore cannot contain other materials.

However, the preamble of the claims state that the electrode is being prepared by steps "comprising of", which is not closed ended and lends itself to including other steps that may not be mentioned. For example, if the electrode material is to only include carbon nanotubes and a binder consisting of sulfur, metal nanoparticles or both, the claims should be written in such a manner as to indicate that "the electrode material consists of" such things. As it is stated now, an organic or polymer binder is not excluded from being part of the electrode material.

(b) The Tests presented on pages 30-31 of the specification do not indicate unexpected results from that of other secondary batteries. Choi et al. (US 7,029,796) indicates that the positive active electrode material uses different quantities of sulfur particles and the conductive agent of carbon nanoparticles to change the relative capacity of the battery. By manipulating the quantity of the materials used and the type of materials used, it is expected that capacity and resistance ratios will change with the change in material.

(c) Carrying out the heat treatment process under vacuum is done in a non-reactive atmosphere, which is the same type of atmosphere that is obtained by using an inert atmosphere. Also, it is stated in step (3) that there is subsequent pressing OR subsequent heat treating OR subsequent simultaneous pressing and heat treating.

Therefore, Dasgupta et al. is not required to teach simultaneous pressing and heat treating since it teaches subsequent heat treating.

(d) Applicant is making a piecemeal argument with respect to the secondary reference and is not addressing the combination of references applied in the rejection. As noted in the rejection in paragraph 6 above, Choi et al. (7,029,796) and Dasgupta et al. disclose the process of preparing a carbon nanotube electrode. Thus, the primary reference teaches the claim limitation.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karie O'Neill whose telephone number is (571)272-8614. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Karie O'Neill  
Examiner  
Art Unit 1795

KAO

/Mark Ruthkosky/

Primary Examiner, Art Unit 1795